REMARKS

The above amendments and these remarks are responsive to the Office Action mailed February 17, 2005. With entry of this amendment, claims 1-24 are pending. Claims 1, 12, and 22 have been amended. Claims 24-27 are added. No new matter has been added by these amendments.

Applicants thank the Examiner for carefully considering the subject application.

The Office action applies Ogiso (US Patent 6,640,756), Clarke et al. (US Patent 5,117,790), and Matsumoto et al. (EP 1 054 148) to claims 1-23 under 35 U.S.C. §102.

Applicants amend the claims as indicated above. In review of the remarks below, and the amendment above, Applicants respectfully request reconsideration of the application under 37 C.F.R. § 1.111.

A. Introduction

Before describing the claims in detail, Applicants believe some background information may be useful.

As noted in Applicants' specification, methods are known to control intake and exhaust valve operation using electromagnetically actuated valves to promote cylinder air charge swirl. For example, several valve configurations that may be operated in one or more operational modes are described in U.S. 6,374,813. This is similar to Clarke et al. in that Clarke et al. also describes several different valve modes. However, the inventors of the subject application have recognized various ways to achieve improved operation by, during a cycle of the engine, operating a group of valves in a first cylinder group performing combustion that is different from a group of operating valves in a second cylinder group, which are also performing combustion.

One potential advantage is compensating for asymmetric exhaust manifolds. In other words, where catalyst locations are different between cylinder banks of an engine, such differences can result in variations in time to efficient operation after a start, thereby increasing emissions on one of the banks. However, by utilizing different valves in different groups and carrying out combustion in both groups, cylinder combustion products and exhaust heat generation can be tailored to a specific exhaust system configuration.

Another potential advantage is the ability to perform cylinder specific diagnostics. For example, all cylinders, with the exception of the cylinder being evaluated, can be operated in a base configuration. Then, the cylinder under evaluation, i.e., a cylinder in the second cylinder group, can be operated with additional valves to provide additional flow and potentially a different air-fuel ratio. Thus, by utilizing different valves in different groups and carrying out combustion in both groups, assessment of the operation of a specific cylinder can be less perceptible than by other methods.

Still another advantage is the ability to have different cylinders providing different combustion products at similar torque levels. This permits engine emissions to be adapted to a specific catalyst system. As mentioned above, asymmetric exhaust systems with different catalyst locations between engine bank is one example. Further, different shape catalysts and different catalyst substrate densities can also be compensated.

Yet another advantage of operating different valves in different groups and carrying out combustion in both groups is the potential ability to tune intake manifold design with valve configuration and timing. For example, by changing the valve configuration, air flow rates and timing can be adjusted to improve engine breathing. This can increase engine power and volumetric efficiency.

As shown below, none of the cited references show a controller that, during a cycle of the engine, operates a group of valves in a first cylinder group that is different from a group of operating valves in a second cylinder group, where both the first and second groups perform combustion during the engine cycle. Further, none of the cited references recognize any of the advantages such operation can provide.

B. Claim 1

As noted above, each of Ogiso (US Patent 6,640,756), Clarke et al. (US Patent 5,117,790), and Matsumoto et al. (EP 1 054 148) were applied to claim 1 under 35 U.S.C. §102. Applicants respectfully submit that each reference fails to show all claimed limitations.

B.1 Ogiso

Ogiso relates to an electromagnetic valve controller which selectively implements a normal operation mode and a valve-stopped operation mode of an internal combustion engine. The normal operation mode is a mode in which all of the electromagnetic valves are controlled in order to implement the four-cycle operation of the internal combustion engine. The valve-stopped operations are described by the citations provided below from Col. 4: 59 to Col. 5: 4:

> The valve-stopped operation herein means the single-valve operation, the reduced-cylinder operation, the six-stroke per cycle operation (the six-cycle operation), and the like. The single-valve operation herein refers to operation in which one of the two intake valves 36 (or one of the two exhaust valves 40) in each cylinder is stopped. The reduced-cylinder operation herein refers to operation in which at least one of the cylinders is stopped. The six-cycle operation refers to operation in which cycle described above is conducted during every six strokes (four strokes and two extra strokes) of the piston (i.e., every time the crank angle changes by 1,080 degrees).

In the single-valve operation, one of the intake valve or the exhaust valves is stopped in each cylinder. Thus, there are no different valve operations between the groups during a cycle of the engine. In the reduced-cylinder operation, when at least one of the cylinders is stopped, there is no combustion in that cylinder. In the six-cycle operation, one cycle is conducted during every six strokes. Again, there is no different valve operations between groups during a cycle.

Unlike Ogiso, Claim 1 specifies that a group of valves in the first cylinder group is operated differently from a group of valves in the second cylinder group, where both cylinder groups perform combustion. Thus, neither the single-valve operation nor the six cycle operation of Ogiso shows the elements of Claim 1. Finally, the reduced cylinder operation in Ogiso where one cylinder or one group of cylinders is stopped also fails to show combustion being performed in both a first and second group.

B.2 Clarke et al.

Clarke et al. relates to a method of engine operation using fully flexible valve and injection events. "The ordering of cylinder events may be different for separate groups of cylinders, or on a per cylinder basis" (col. 3: 51-53). Several modes of operation used in the start sequence are shown at Fig. 4.

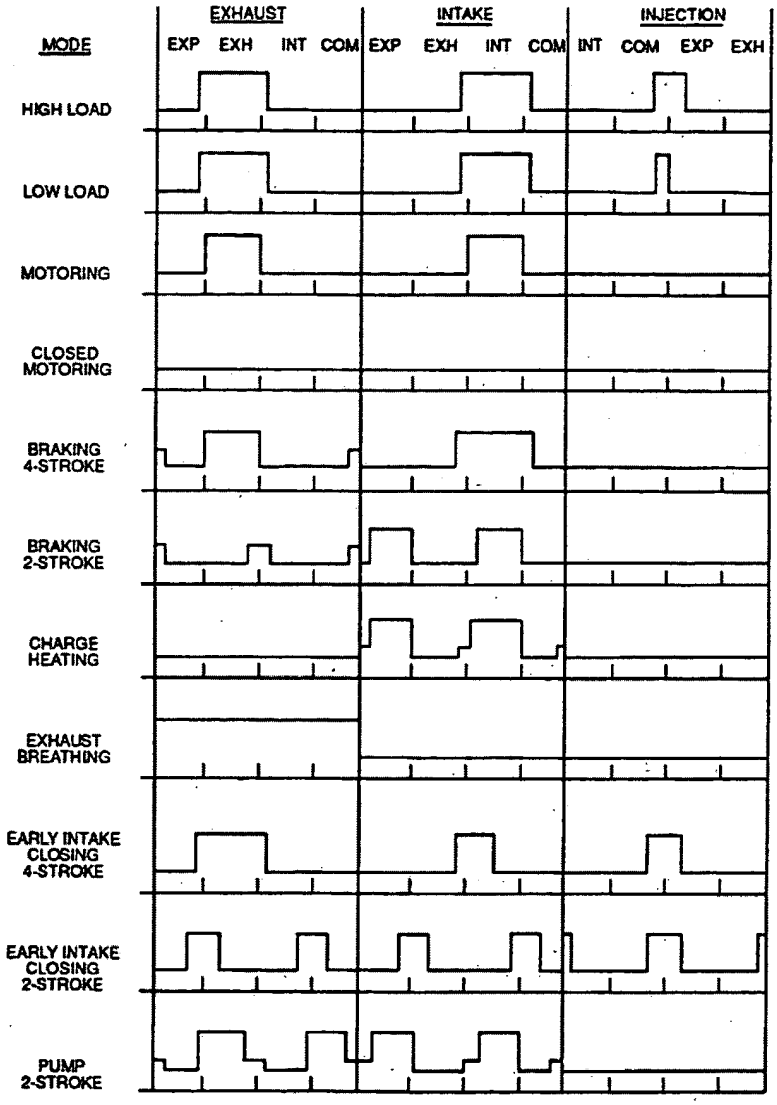

Figure 4

However, Fig. 4 also shows that there is no fuel injection or combustion in the following modes: motoring, closed motoring, braking 4-stroke, braking 2-stroke, charge heating, exhaust breathing, and pump 2-stroke. Thus, no combustion is conducted in these modes. Combustion presumably occurs in the early intake closing 4-stroke and early intake closing 2-storke modes, as well as the low and high load modes, in which fuel is injected. Also note that in each mode where fuel is injected, a single exhaust valve and intake valve are used.

The different modes of operation of cylinders are used in the engine starting sequence. Figure 6 is a flowchart depicting a starting sequence mode of operation.

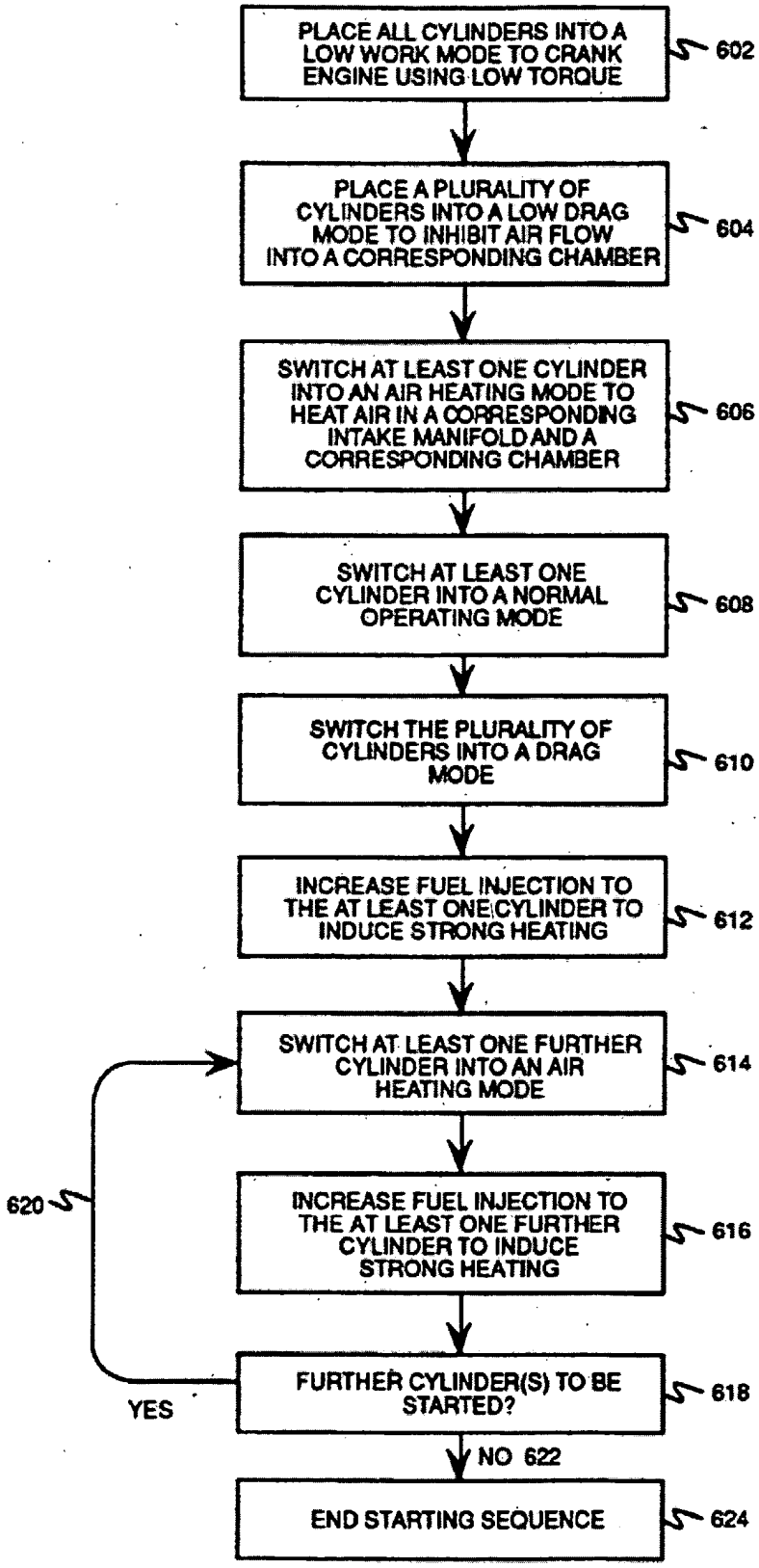
PLACE ALL CYLINDERS INTO A LOW WORK MODE TO CRANK ENGINE USING LOW TORQUE
602
PLACE A PLURALITY OF CYLINDERS INTO A LOW DRAG MODE TO INHIBIT AIR FLOW INTO A CORRESPONDING CHAMBER
604
SWITCH AT LEAST ONE CYLINDER INTO AN AIR HEATING MODE TO HEAT AIR IN A CORRESPONDING INTAKE MANIFOLD AND A CORRESPONDING CHAMBER
606
SWITCH AT LEAST ONE CYLINDER INTO A NORMAL OPERATING MODE
608
SWITCH THE PLURALITY OF CYLINDERS INTO A DRAG MODE
610
INCREASE FUEL INJECTION TO THE AT LEAST ONE CYLINDER TO INDUCE STRONG HEATING
612
SWITCH AT LEAST ONE FURTHER CYLINDER INTO AN AIR HEATING MODE
614
620
INCREASE FUEL INJECTION TO THE AT LEAST ONE FURTHER CYLINDER TO INDUCE STRONG HEATING
616
FURTHER CYLINDER(S) TO BE STARTED?
618
YES
NO 622
END STARTING SEQUENCE
624

Figure 6

In the start sequence shown by Figure 6, the low work mode in step 602 can be either exhaust breathing mode or closed motoring mode illustrated in the Figure 4. The low drag mode in step 604 can be exhausting breathing mode. The air heating mode in step 606 discharges compressed air back into the intake manifolds, by opening of the intake valves near the end of compression. No fuel is injected during air heating mode (*see* col. 4: 34-38). The steps 602, 604, and 606 involve the engine starting and there is no combustion occurring in these steps. Cylinders are operated in different modes in this start sequence until all cylinders that were originally placed in the low work mode are brought on line sequentially.

Therefore, in Clarke et al., different cylinders or groups of cylinders are operated in different modes by controlling an intake or exhaust valves during the engine starting process. Once the start sequence is completed, the engine is operating in the modes with fuel injection or combustion. As shown by Figure 4, any combination of modes of operation with combustion results in the same valve operation in different groups: one intake valve and one exhaust valve which are electrically actuated by a control system.

Unlike Clarke et al., Claim 1 specifies that two groups of cylinders have different valve configurations or operations during a cycle of an engine performing the combustion. Thus, Clarke et al. fails to show all claimed limitations.

B.3 Matsumoto et al.

Matsumoto et al. relates to an internal combustion engine having solenoid-operated valves which is operable in a partial operating mode with at least one of the cylinders being deactivated by inhibiting combustion under deactivation control. One embodiment discloses an internal combustion engine that is "operable in a partial operating mode in which fuel injection

and ignition are inhibited in a selected one or more cylinders, out of the four cylinders of the engine, so that the selected cylinders are deactivated or disabled (cylinder deactivation control)." [0032].

Unlike Matsumoto, et al., Claim 1 specifies that two groups of cylinders have different valve configurations or operation during a cycle of an engine, both performing combustion. Since no combustion is conducted in the cylinder deactivation control, Matsumoto fails to show all claimed limitations.

Thus, Applicants respectfully submit that the rejections of Claim 1 be withdrawn.

Claims 2-11

Claims 2-11 are rejected under 35 U.S.C. § 102 as being anticipated by Ogiso, Clarke et al., and Matsumoto et al. Claims 2-11 are dependent on Claim 1, and therefore the rejections should be withdrawn.

Claim 12

Claims 12 is rejected under 35 U.S.C. § 102 as being as being anticipated by Ogiso, Clarke et al., and Matsumoto et al.

For similar reasons stated for Claim 1, Claim 12 neither Ogiso nor Matsumoto et al. show a first and second cylinder groups are operated during a cycle of engine performing combustion. Also, any combination of modes with combustion in Clarke et al result in same valve operation in different groups: one intake valve and one exhaust valve. Thus, Clarke et al. also fails to show all claimed limitations. Therefore the rejections of Claim 12 should be withdrawn.

Claims 13-21

Claims 13-21 are rejected under 35 U.S.C. § 102 as being anticipated by Ogiso, Clarke et al., and Matsumoto et al. Claims 13-21 are dependent on Claim 12, and therefore the rejections should be withdrawn.

Claims 22-23

For similar reasons stated for Claim 1, Ogiso, Clarke et al., and Matsumoto et al. fail to shows all claimed limitations of Claim 22. Claim 23 is dependent on Claim 22. Therefore, the rejections of Claims 22-23 should be withdrawn.

Claims 24-27

For similar reasons stated for Claims 12, Ogiso, Clarke et al., and Matsumoto et al. fail to shows all claimed limitations of Claim 24. Support of Claim 24 can be found, for example, in Figures 23-27, the corresponding text, and throughout the specification. Claims 25-27 are dependent on Claim 24.

Based on the foregoing comments, the above-identified application is believed to be in condition for allowance, and such allowance is courteously solicited. If any further amendment is necessary to advance prosecution and place this case in allowable condition, the Examiner is courteously requested to contact the undersigned by fax or telephone at the number listed below.

Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account 06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being sent via first class mail to Mail Stop AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on May 5, 2005.

Lauren Barberena

Respectfully submitted,

ALLEMAN HALL MCCOY RUSSELL & TUTTLE LLP

Christopher S. Tuttle
Registration No. 41,357
Customer No. 36865
Attorney for Applicant
806 SW Broadway, Suite 600
Portland, Oregon 97205
Tel: (503) 459-4141
Fax: (503) 459-4142